FLORISTIC AND ECOLOGICAL NOTES

On some little known unicellular and colony-forming algae from a Dutch moorland pool complex

F.A.C. KOUWETS*

SUMMARY. — An extensive survey of the algal flora of a moorland pool complex near Saasveld (The Netherlands) was carried out. Among other methods, the catching of specimens on glass slides was employed. Especially by means of this artificial substrate a number of singular and up to now usually hardly recorded taxa were found. These taxa are generally substrate-bound, either directly (periphyton) or indirectly (pseudoperiphyton). Of the 18 species discussed in the present paper 11 had not earlier been reported as occuring in the Netherlands: *Bicoeca stellata, Salpingoeca lefevrei, Dendromonas cryptostylis, Poteriochromonas nutans, Lagynion macrotrachelum, Dinastridium sexangulare, Rhabdomonas costata, Colacium mucronatum, Askenasyella chlamydopus, Saturnella saturnus* and *Trochiscia aciculifera*.

The species treated here could be referred to three groups on the basis of their local distribution in the area studied, the principal criteria being a specific pH range and the degree of organic pollution.

RÉSUMÉ. — Un vaste inventaire de la flore algale a été effectué dans un groupe de mares à proximité de Saasveld (Pays-Bas). En plus d'autres méthodes de récolte, on a fait usage de lames porte-objet comme substratum artificiel. On a trouvé quelques taxons remarquables, qui sont peu mentionnés dans la littérature; la plupart de ces taxons est dépendante du substratum, ou bien directement (périphyton), ou bien indirectement (pseudopériphyton). Dix-huit espèces sont discutées séparément dans cet article, parmi lesquelles onze n'ont pas été mentionnées jusqu'à présent comme membres de la flore néerlandaise, c'est-à-dire *Bicoeca stellata, Salpingoeca lefevrei, Dendromonas cryptostylis, Poteriochromonas nutans, Lagynion macrotrachelum, Dinastridium sexangulare, Rhabdomonas costata, Colacium mucronatum, Askenasyella chlamydopus, Saturnella saturnus*, et *Troschiscia aciculifera*. Il était possible de classer les espèces discutées dans trois groupes en vertu de leur distribution dans la région étudiée; les critères les plus importants étaient les valeurs de pH et le degré de la pollution organique où elles ont été trouvées.

* Hugo de Vries-Laboratorium, Universiteit van Amsterdam, Plantage Middenlaan 2 A, 1018 DD Amsterdam.

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INTRODUCTION

During a survey of the algal flora of the moorland pools in the nature conservancy «Molenven» (near Saasveld, The Netherlands), during 1977 and 1978, a number of interesting taxa belonging to a wide range of classes were encountered. Some of these appeared to have so far only been recorded on rare occasions.

The investigation was based on the analysis of plankton samples and samples obtained by squeezing submerged aquatics, augmented by periphyton caught by means of glass slides as an artificial substrate. In all 164 samples were studied. The exposure time of the slides varied from one day to 35 days.

The increasing employment of artificial substrates in studies of microphyte communities in the Netherlands has resulted in the recording of an ever-swelling number of new records for the Dutch Flora (compare SCHREIJER, 1979). It is rather striking that the material studied during the present investigation yielded not only new and interesting records of periphytonic taxa (which are obligatorily substrate-bound) but also of the free-living pseudoperiphytonic forms among them.

THE STUDY AREA

The conservancy «Molenven» is a remnant of a formerly very extensive peat bog which originated as far back as the Upper Pleniglacial of the last Ice Age. Since medieval times in the whole area, the present nature reserve included, extensive peat digging took place so that the Late-Glacial, initial situation was restored (VAN DER HAMMEN & MAARLEVELD, 1970).

At present the area, covering 42 hectares, consists of a western part in which lie two pools surrounded by a sandy ridge covered by a stand of *Betula*, and a sloping peaty bank covered with mainly *Erica tetralix, Calluna vulgaris, Myrica gale* and *Phragmites australis* vegetation interspersed with *Sphagnum* spp. respectively, and an eastern part in which lies a single pool whose banks are of both above-mentioned types. The center of this eastern portion is covered with a patch of reed growing on peat layers and surrounded by birch and sallow carr. The entire reserve is surrounded by sandy ridges covered with scotch pines, birches and heather.

The water of the two western pools is clear, colourless, acid (pH 3.4-4.5), poor in nutrients and hardly polluted (content of total-P: 0.05-0.2 mg/l; of $N.NO_2$: 0.005-0.01 mg/l; of $N.NH_4$: 2-10 mg/l), and has an oxygen content between 50% and over 100% saturation. The predominant macrophyte here is *Juncus bulbosus* var. *fluitans*.

The water in the eastern part, on the other hand, can be described as dystrophic on account of its brownish colour. The pH values are as high as 3.5-6.4 and there is a not inconsiderable organic pollution (content of total-P: 0.5-2.0, occasionally up to 3.7 mg/l; of $N.NO_2$: 0.01-6.2 mg/l; of $N.NH_4$: 20-

40 mg/l). The oxygen content varies between 10% and 50% saturation and there are no macrophytes present. The pollution is partly attribuable to large flights of starlings spending the night in the reed patch and partly to an inflow of rain water from the locally enriched soil in the eastern part of the conservancy. The enrichment in question is the result of the former presence of a drain ditch carrying agricultural water polluted with fertilisers through the reserve during the first half of the century.

ECOLOGICAL GROUPS OF SPECIES

The 18 algal taxa to be discussed presently have been referred to three groups on the basis of their local pattern of occurence, and are shown accordingly on three separate plates (I-III).

Group I (Plate I) consists of the species *Lagynion macrotrachelum* Pascher, *Desmatractum bipyramidatum* (Chod.) Pascher, *Saturnella saturnus* (Steinecke) Fott, *Trochiscia aciculifera* (Lagerh.) Hansgirg, *Dicranochaete reniformis* Hieronymus and *D. reniformis* fo. *pleiotricha* Hieronymus. These species are characterised by their consistent presence in more or less acid, oligotrophic environments, on places where no or hardly any demonstrably organic pollution occured.

Group II (Plate II) consists of the species *Poteriochromonas nutans* Jane, *Mallomonas lychenensis* Conrad, *Synura petersenii* Karshikov, *Dinastridium sexangulare* Pascher and *Rhabdomonas costata* (Korsh.) Pringsheim. Although these species are found in water with low pH values, they were only encountered in dystrophic and somewhat organically polluted environments. As a rule the bottom was covered with fallen leaves.

Group III (Plate III) includes the species *Bicoeca stellata* Bourrelly, *Pachysoeca obliqua* Fott, *Salpingoeca lefevrei* Bourrelly & Fusey, *Dendromonas cryptostylis* Skuja, *Phacus skujae* (Lemm.) Skvortzov, *Colacium mucronatum* Bourrelly & Chadefaud and *Askenasyella chlamydopus* Schmidle. These species are characterised by their sole occurence in dystrophic situations, always with some manifest organic pollution.

Barring two species (*Synura petersenii* and *Trochiscia aciculifera*) all taxa dealt with here were studied in the living condition and after fixation in Utermöhl, formalin or Aquamount.

The figures were drawn by means of a prism, partly of living specimens and partly of fixed material (compare the annotations in the discussion of the species). The taxa marked with an asterisk are new records for The Netherlands as far as can be ascertained by means of the lists of DRESSCHER (1976), where possible augmented by more recent publications.

ANNOTATED LIST OF SPECIES

* ***Bicoeca stellata*** **Bourrelly**
(Fig. 14, living material)

B. stellata is a freely moving, colourless flagellate forming colonies, which was observed now and then twisting and turning among the filamentous algae growing on glass slides. Its colonies consisted of about 20 individuals. The separate thecae are oblong-cylindrical with a rounded and sometimes slightly widened basal part; the mouth is often somewhat widened. Their maximum size was about 26-7μm. The thecae are joined at their bases to form a somewhat irregular, three-dimensional and stellate colony attaining a size of about 60μm. The living flagellate measures about 9 x 5μm. BOURRELLY (1951) described this species from a lake fed by alkaline water in which it was very common in the spring. In the Molenven it occurred in the early summer in places where organic enrichment had taken place, at a specific conductivity of 150-170μS/cm (at 25°C). SKUJA (1956) recorded *Bicoeca socialis* Lauterborn from Sweden, but his figure is highly reminiscent of *B. stellata*. His material also consisted of three-dimentional colonies and the individual thecae measured 20-25 x 6-9.5μm. An illustration in LAUTERBORN (1899) indicates that the colonies of *B. socialis* consists of thecae arranged in a single plane, and moreover, that the thecae are much more widened at the base. It is also striking that, judging by LAUTERBORN's figure, the colonies of *B. socialis* contain a central open space because the thecae are joined more laterally. Such a central cavity was not noted in my material of *B. stellata*.

Pachysoeca obliqua **Fott**
(Fig. 12; Aquamount)

This colourless flagellate forms a theca usually incrustated by dark brown iron compounds and slightly scalloped at the base. Its opening is markedly excentrical. The specimens recorded from the Molenven had thecae 7-11μm in diameter. *P. obliqua* was only observed in a sessile condition on glass slides, and only where a strong organic load was present. It was consistently associated with another colourless flagellate: *Diploeca flava* (Korsh.) Bourrelly. According to FOTT (1960 a) *P. obliqua* is mainly found as an epiphyt on other algae in moderately eutrophic waters. The species had previously been recorded in The Netherlands from the Ankeveen broads (DRESSCHER, 1976), where it was found in water with a pH of 6.8-8.1 and a conductivity of about 350μS/cm. At the Molenven sites the pH values were 5.8-6.3 and the conductivity 210-280μS/cm.

* ***Salpingoeca lefevrei*** **Bourrelly & Fusey**
(Fig. 13; living material)

The theca of this colourless choanoflagellate is oblong and attenuated at the base into an acute point with at the tip often something suggestive of an attaching disk. The opening is sometimes widening and the wall has two faint constrictions dividing the theca into more or less equal parts. The living flagellate does not by far fill its theca but occupies only the uppermost half. The thecae of the Dutch specimens measured 30-38 x 6.5-8μm.

BOURRELLY & FUSEY (1948) found this species very frequently on various filamentous algae in samples from two pools, but the present author saw it only attached to glass slides in water with a pH value of 4.2-6.3 and a conductivity of 170-280μS/cm. On one occasion a specimen was found with an about 5μm long stalk attached to the theca which suggested a likeness with the species *Salpingoeca serpettei* described by BOURRELLY (1947a) albeit that the constrictions were not so pronounced as reported for the latter species (Fig. 13 c).

* ***Dendromonas cryptostylis*** **Skuja**
(Fig. 15; living material)

The colonies of *D. cryptostylis* consists of thin and irregularly ramified, twisted stalks each carrying at its tip a flagellate cell. At the connection with the cellular body the stalk becomes extremely tenuous and is hardly discernible even under a phase contrast microscope. The individual cells are 6-7 x 10μm in size and biflagellate. One flagella is more than twice the length of the cell body and the other is about half as long as the body of the flagellate. In a few of the specimens something could be observed which could have been a bronze-coloured chromatophore.

LEMMERMANN (1914) includes the genus *Dendromonas* in the Monadaceae, and also SKUJA (1948) refers *D. cryptostylis* to this family. PASCHER (1942) considers *Dendromonas* to be the colourless parallel form of *Chrysodendron* whereas BOURRELLY (1957; 1968) places the genus *Dendromonas* in the Chrysophyceae. *D. cryptostylis* differs from *D. laxa* (Kent) Blochmann and from *D. virgaria* (Weisse) Stein especially in the shape of the stalk, the mode of branching, and the lengths of the flagellae.

BOURRELLY (1947b) mentioned *Cladonema pauperum* Pascher with the note that this species must frequently have been confused with *Cladonema laxum* Kent (= *Dendromonas laxa* (Kent) Blochmann), which statement is elucidated with a figure highly suggestive of *D. cryptostylis*. The genus *Cladonema* has already been included in the Chrysophyceae by PASCHER (1942). Presumably also on account of this misidentification only the species discussed by LEMMERMANN (1914) viz., *D. laxa* and *D. virgaria* had previously been recorded from The Netherlands (DRESSCHER, 1976). SKUJA (1956) mentions *D. cryptostylis* from several small bodies of water in the Uppsala area rich in aquatic vegetation. The present author found this species attached to slides and to detritus particles in water with a pH value of 4.0-6.3 and a conductivity of 180-280μS/cm.

* ***Poteriochromonas nutans*** **Jane**
(Fig. 11; living material)

The flagellate *P. nutans* inhabits an obconical theca which in the specimens in hand was attached to a stalk at most 40μm long. The 8-11μm high theca had the same diameter as the living flagellate, viz., 7-9μm, and was bisected by a horizontal septum. The flagellate sits in the upper, open part; it is not clear whether the lower part is hollow or massive. Occasionally a theca was encountered with a slightly inwardly bent upper edge (Fig. 11c, d). The flagellate has a short and not very motile flagella about half as long as the cell diameter and a long, fastly undulating one which is more than twice as long as the cell diameter. The olive-green chromatophores reported by JANE (1944) were barely discernible or not at all visible. A characteristic phenomenon exhibited by this species is the sudden change of the direction of the theca in respect of its stalk, which is attribuable to the fact that the latter is thinnest at the point of transition to the theca. The mode of attachment, the length of the stalk, and the shape of the theca can usually hardly be assessed (compare JANE, 1944; PETERSEN & HANSEN, 1960). JANE (l. c.) found this species attached to *Oedogonium* filaments, and PETERSEN & HANSEN (l. c.) recorded it from a water lily pool at pH 5.1. The present author found *P. nutans* only in the months of March, April, and May, 1978 at pH values of 3.6-4.4 and a conductivity of 90-170µS/cm.

* ***Lagynion macrotrachelum*** **Pascher**
(Fig. 1; living material)

This species was regularly encountered, especially by the beginning of the summer of 1978, as an epiphyte on such filamentous algae as *Mougeotia* and *Microspora*, often aggregated in clusters (Fig. 1a). In spite of the fact that it also occured on algal filaments growing on glass slides, it was never found directly attached to the glass. The hyaline theca of this rhizopodial Chrysophyt consists of two parts, viz., of a 12-17 x 7-10µm large semiglobose, basal part, and on top of it a kind of «chimney» with a usually somewhat widened aperture. The dimensions of this part are at most 6 x 4µm. The forms in hand agree satisfactorily with specimens depicted by PRESCOTT (1962). The species possesses two brightly bronze-coloured chromatophores, and in a number of cases the protruding rhizopod could be discerned. PRESCOTT (l. c.) mentions *L. macrotrachelum* as a species of common occurence on *Microspora* and other filamentous algae, especially in soft water lakes. The present author found it in water with a pH range of 3.9-5.5 and a conductivity of 160-190µS/cm.

Mallomonas lychenensis **Conrad**
(Fig. 10; Utermöhl)

This species of *Mallomonas* has only recently been recorded for The Netherlands: WUJEK & VAN DER VEER (1976) report its occurence in the dystrophic Siepelveen (province of Drenthe). Specimens of this taxon were mainly present in a number of plankton samples, all collected on March 1, 1978. The pH of the sampling sites ranged from 3.5-5.3 and the conductivities from 140-250µS/cm. CONRAD recorded this species from a pool surrounded by a stand of birch (1938) and from dystrophic environment (1941); HARRIS (1955) mentioned it as occuring in lakes which were of very different types, and BOURRELLY (1957), finally stated that it feels at home in an acid environment. The cell size in the specimens in hand were 23-30 x 13-14µm. In preparations cleared by means of H_2O_2 and $KMnO_4$ and studied by means of phase-contrast microscopy, the collar and the body scales of *M. lychenensis* were clearly discernible. These body scales, about 7.6 x 4.8μm in size, are provided with two rows of perforations, one of which extends a little beyond the other one (Fig. 10 e), which agrees with electron-photomicrographs published by HARRIS & BRADLEY (1956), and by WUJEK & VAN DER VEER (1976). The number of perforations, on the other hand, seems to the present author to be rather variable, however, so that in a number of cases a type of scaling is generated reminiscent of *M. allorgei* (Defl.) Conrad, but the latter species is devoid of collar scales (compare also BOURRELLY, 1947 b).

Synura petersenii Korshikov
(Fig. 9; formalin)

The sediment of a sample taken on April 4, 1978 (pH 4.4, conductivity 160μS/cm), appeared to consist almost exclusively of disintegrated colonies of species of *Synura*. At first sight it seemed to be the species *S. uvella* Ehrb., but phase-contrast observations of the silica scales in preparations cleared by means of H_2O_2 and $KMnO_4$ indicated that the material is referable to *S. petersenii*. The resemblance between colonies of the various species of *Synura* renders all records of the species *S. uvella* not accompanied by a description of the structure of the scales (as in, e. g., BEIJERINCK, 1926) highly unreliable, the more so since it has been established that *S. petersenii* happens to be the most common species (KORSHIKOV, 1929; SKUJA, 1948; BOURRELLY, 1957; KRISTIANSEN, 1975), with a maximum of abundance in the spring and in the autumn, and preferring a pH of about 6. *S. petersenii* has only recently been reported from a few localities in The Netherlands (WUJEK & VAN DER VEER, 1976).

* **Dinastridium sexangulare Pascher**
(Fig. 7; living material)

This dinococcalean dinophyte was found in fairly large numbers on glass slides which had been exposed during the whole month of march, 1978, and was also occasionally observed in squeeze samples collected in the spring of 1978. The pH at the sampling sites ranges from 3.6 to 4.4 and the conductivity from 160 to 280μS/cm. The cells attain a size of 35μm as a maximum. They are irregularly hexagonal with at the angles 0-3 short (5-7μm long) spines. As far as could be ascertained the only previous record of *D. sexangulare* is by PASCHER, who gave an extensive description of this taxon with which the Dutch specimens agree very closely. The localities mentioned by PASCHER include pools near Brunsvig and a peaty area in Upper Austria. Autospores and motile spores, described by PASCHER, were not observed.

* ***Rhabdomonas costata*** **(Korsh.) Pringsheim**
(Fig. 8; formalin)

R. costata is slightly metabolic, colourless euglenophyte identifiable by 6-8 longitudinal grooves on the faintly bent cell body. In the cytoplasm a varying number of paramylum concretions is present. The body size varied from 23-30 x 8-9μm. This species is found principally in peaty areas, also among leaves fallen into the water (HUBER-PESTALOZZI, 1955). SKUJA (1956) recorded it as a fairly common species from a great number of sampling stations in Sweden where it often occurs to greater depths (up to 22μm). In the Molenven *R. costata* was encountered in large numbers in the pseudoperiphyton at a pH of about 4.5 and a conductivity of 140μS/cm, but also in a slimy coat on mud mainly consisting of blue-green algae.

Phacus skujae **(Lemm.) Skvortzov**
(Fig. 16; living material)

Specimens of a species of *Phacus* neatly corresponding with SKUJA's description and figures of *Phacus pusilla* Lemmermann (SKUJA, 1926) were regularly found by the present author. SKVORTZOV (1928) considers this record by SKUJA as a separate species, however, but without any explanation, and named it *Phacus skujae* to which he also referred the report of *Ph. pusilla* in DREZEPOLSKI (1925). POCHMANN (1942) does not agree, however, and refers *Ph. pusilla* sensu DREZEPOLSKI to *Phacus inflexus* (Kiss.) Pochmann. HUBER-PESTALOZZI (1955), who seems to be willing to accept POCHAMNN's viewpoint, also mentions *Ph. skujae* Skv. as a synonym of *Ph. inflexus*, however, without the qualification «pro parte», whereas on the other hand he states that *Ph. skujae* is closely related with *Ph. granum* Drezepolski and *Ph. inflexus*.

The present author found *Ph. skujae* in several samples with a pH of 3.5 to 6.3 and a conductivity of 90-280μS/cm. The whole assembly of small and closely related species of *Phacus* occurs in various stagnant and often boggy or peaty waters. *Ph. skujae* had previously been recorded from The Netherlands by DRESSCHER (1976) from an oligohaline environment north of Amsterdam.

* ***Colacium mucronatum*** **Bourrelly & Chadefaud**
(Fig. 17; living material)

On a glass slide that had been exposed during the whole month of November, 1978, at a pH of 6.3 and a conductivity of 240-280μS/cm, *C. mucronatum* was observed in the form of solitary specimens and small colonies consisting of two individuals. The acutely attenuated cells are inserted on a gelatinous stalk (which is ramified when colonies are formed) and show at their bases the incurvation characteristic of the species. The cell dimensions are about 30 x 14μm. The free-swimming stage which possesses a flagella and a stigma could not be found in the above-mentioned sample. The type material came from mud in a drainage dike containing slightly alkaline water (BOURRELLY, 1953; fide HUBER-PESTALOZZI, 1955).

* ***Askenasyella chlamydopus*** **Schmidle**
(Fig. 18; living material)

A. chlamydopus is a colony-forming alga whose tear-shaped and up to 10 x 5μm large cells are rather loosely arranged in an almost invisible gelatinous ground mass. The outer limit of the gelatinous substance could only be observed in small colonies, and these also exhibited the presence of what looks like connections between the individual cells. SCHMILDE (1902) recorded this species from a rivulet near Kaiserslautern, where it was found in the autumn, sometimes epiphytically on moss leaves, sometimes free-floating in the water. The Dutch material was found on glass slides in the autumn of 1978 at a pH range of 5.7-6.3 and a conductivity of 190-280μS/cm.

The systematic position of this alga is uncertain. SCHMIDLE (l. c.) suggested that this species would have to be placed near the genus *Characiopsis*. PASCHER referred it, successively, to the Heterokontae (1925) and the Chlorophyceae (1937). SMITH (1950), finally, classified it among the Palmellaceae (Tetrasporales).

Also as regards its reproduction *A. chlamydopus* is insufficiently known. SCHMILDE (l. c.) described zoospores, said to be formed in groups of 4, 8, or 16 in a mothercell transformed into a zoosporangium, and to escape from it through a hole in the wall. These zoospores were reported to be uniflagellate, but this was queried by SCHMIDLE himself and also by PASCHER (1937). In the Dutch material two forms of reproduction could be observed. In the first place regularly the formation of autospores took place in fours in the same mothercell; these spores break through the cell wall and subsequently grow out to the size of the other cells (fig. 18b, c). The colony in this way increased in size. The second mode of propagation is by means of macrozoospores and could be studied in specimens growing on glass slides which had been exposed during the whole month of November, 1978. In this case a cell aquires two flagellae subsequently to detach itself from the colony and to swim away. In some of these macrozoospores something resembling a stigma was seen. In contrast to the situation in the vegetative cells of the colony, the very tenuous extension of the chloroplast described by SCHMIDLE (l. c.) was visible in these zoospores (Fig. 18 e). This structure is to the present author's mind strongly reminiscent of the one found in the volvocalean genus *Chlorogonium*. The attachment of the flagellae was always very obscure, however. From Madras, RAMANATHAN (1968) described a second *Askenasyella* species: *A. randhawai*, of which the pear shaped cells were attached to the glass substrate by their pointed anterior ends, lying enclosed in a common mucilaginous envelope. The cells showed two threadlike structures, similar to the one in *A. chlamydopus*, along with contractile vacuoles. These features should justify the insertion of *Askenasyella* in the Tetrasporales.

The swarmers of *A. randhawai* contain a stigma and two flagellae, but not the threadlike extention of the chloroplast, as do the swarmers of *A. chlamydopus* (see above). Further RAMANATHAN (l. c.) noticed the resemblance between *Askenasyella* and *Chlorangiogloea*; according to BOURRELLY (1972) these two genera could be synonymous.

Desmatractum bipyramidatum **(Chodat) Pascher**
(Fig. 4; Aquamount)

D. bipyramidatum was found sparingly throughtout the year in the slimy coat formed by bacteria and algae on exposed glass slides. Owing to the transparency of the greater part of the 26-39 x 12-15μm large cells, this alga is very easily overlooked especially when occuring in a dense growth of other algal forms. Phase-contrast optics are absolutely required for the study of the cell morphology. The species was only very recently recorded for the Netherlands by SCHREIJER (1979), who found it in the slimy deposit produced by desmids on glass slides exposed in quivering fen hollows under mesotrophic conditions at a pH of 5.5-6.6 and a conductivity of 150-450μS/cm. The foreign records consistently state that *D. bipyramidatum* is always found in an oligotrophic acid environment (pH usually 4-5, rarely exceeding 6.5), in the bottom ooze or in the slime of various algae and higher aquatics (PASCHER, 1930; LUND, 1942; SKUJA, 1964). In the Molenven the species was collected in water with a pH of 3.5-5.3 and a conductivity of 180-230μS/cm.

* ***Saturnella saturnus*** **(Steinecke) Fott**
(Fig. 3; living material)

This unicellular alga was collected regularly throughout the year in both squeeze samples and the deposit on glass slides. The subglobose cell body with a diameter of 34-40μm, is surrounded by a thin gelatinous sheath which becomes thicker in the equatorial plane to a maximum of 4-14μm. The gelatinous encasing consists of two parts which meet in the equatorial plane. FOTT (1960b) sees herein resemblances with the genus *Desmatractum* and proposes to unite *Saturnella* with, among other taxa *Desmatractum* to form a separate family Treubariaceae. The tendency of the cells to orient themselves with their equatorial plane parallel with the glass slide enhances the chances of confusion with other taxa, especially fixed material showing a great resemblance to solitary cells of *Asterococcus superbus* Scherffel. *S. saturnus* is a typically sphagnicole peat bog form: SKUJA (1959) found it togetehr with mainly acidophilous sphagnobionts in several peat bogs. MATTAUCH (1936) recorded it from a hydrosere in S.-E. Poland at pH 4.0-6.8. The molenven sites had a pH of 3.6-5.8 and a conductivity of 90-280μS/cm.

* ***Trochiscia aciculifera*** **(Lagerheim) Hansgirg**
(Fig. 2; Aquamount)

Although REINSCH (1886) stated that the genus *Troschiscia* can easily be recognised, both BRUNNTHALER (1915) and BOURRELLY (1972) considered most species referred to this genus to be at least doubtful because confusion with resting stages and zygotes of other algal taxa may easily occur. In view of the fact that a dividing cell was found in the slimy bacterial cover of a glass slide exposed for 15 days in September, 1978, any doubt is almost certainly excluded. Two autospores with a diameter of 17-19μm were present which bore on their cell walls a large number of about 4μm long spines and were still surrounded by the wall of the mother cell. The whole image was strongly reminiscent of the illustrations in FRITSCH & RICH (1937, p. 157, fig. 1a,b). These authors report the species from a shallow pool completely overgrown by vegetation in the Transvaal, together with mainly desmids.

KORCHIKOV (1953) made mention of hemizoospores: autospores containing a contractile vacuole and a stigma, but on account of the fact that from this species only preserved material could be studied, the presence hereof could not be established. The present author found *T. aciculifera* in water with a pH of 5.3 and a conductivity of 180μS/cm.

Dicranochaete reniformis **Hieronymus**
(Fig. 5; living material)

D. reniformis **Hier. fo.** ***pleiotricha*** **Hier.**
(Fig. 6; Aquamount)

The exact position of this alga in the system of classification is obscure, because *Dicranochaete* is the only chlorophycean taxon with furcate setae of which there is one in *D. reniformis* and there are 2, 3, or 4 in *D. reniformis* fo. *pleiotricha*. The cell body is subglobose with a depression at the place where a seta protrudes. It is surrounded by a gelatinous coating which usually has a more or less toothed operculum (HIERONYMUS, 1892). The maximum diameter of the species in hand (inclusive of the gelatinous cover) was 25μm. Now and then the impression was gained that the seta already consists of a fascicle of branches at its very base from which the separate elements branch off irregularly. In a number of individuals of the forma *pleiotricha* with four setae, the resemblance with the taxon described by KORSHIKOV (1953) as *Bulbococcus quadrisetus* is striking (Fig. 6b; see also BOURRELLY, 1972) which caused NOVAKOVA & POPOVSKI (1972) to consider *Bulbococcus* as a synonym of *Dicranochaete*. These authors also describe a new *Dicranochaete* species: *D. bohemica*, which is strongly reminiscent to *D. reniformis* fo. *pleiotricha*, but should distinguish itself from this form by its lobulate corolla on the apex of the cell wall, and by its chloroplast which is divided into an increasing number of polygonal plates, as the cell grows older. HIERONYMUS (1892), however, didn't mention anything about the structure and the appearance of the chloroplast and the operculum in *D. reniformis* fo. *pleiotricha*, while, to the present author's mind, the shape of the protuberances on the cell apex of *D. reniformis*. is fairly variable (compare also HIERONYMUS, 1892; HODGETTS, 1916). Therefore, the difference between *D. reniformis* fo. *pleiotricha* and *D. bohemica* is rather obscure (according to the remark in their list of literature, NOVAKOVA & POPOVSKI didn't read HIERONYMUS's article from 1892!), so that as yet the present author considers the forms with four setae in the material studied as belonging to *D. reniformis* fo. *pleiotricha*.

The first record of *D. reniformis* for the Netherlands was by BEIJERINCK (1926) from a locality in many ways very similar to the Molenven site, in water with a pH of 5-6. More recently, SCHREIJER (1979) found it in a mesotrophic quivering bog in water with a pH of 4.5-6.5 and a conductivity of 100-560μS/cm.

The present author found the two forms in large numbers during the whole period of investigation, occasionally on algal filaments, but usually growing directly on glass slides; the type form at pH 3.5-5.8 and at a conductivity of 180-240μS/cm, and the fo. *pleiotricha* at pH 3.5-6.2 and a conductivity of 180-340μS/cm. Both forms were often present on the same exposed glass slide.

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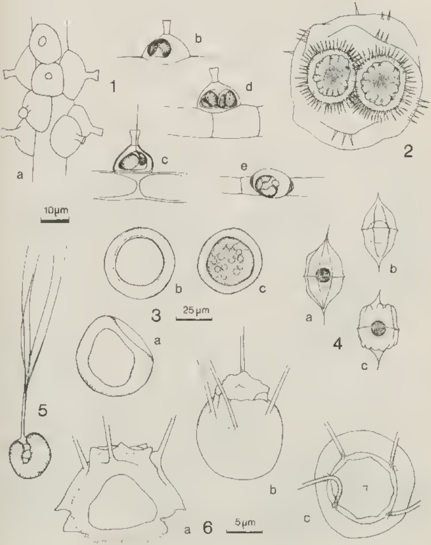
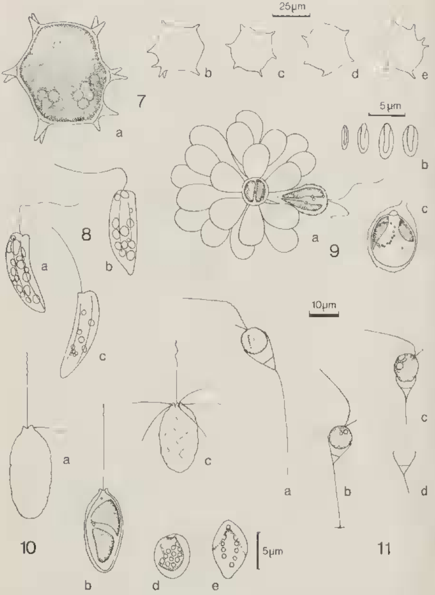
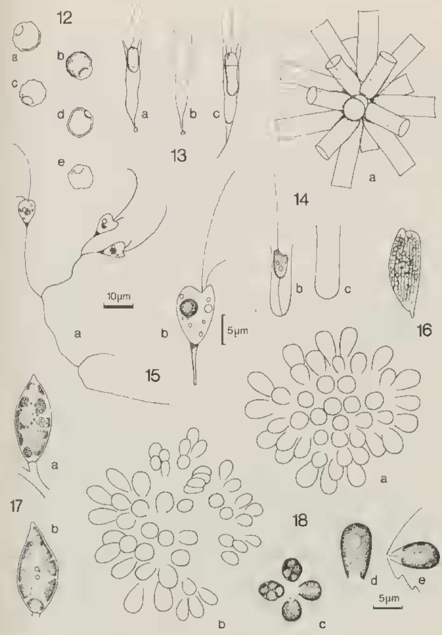


Pl. I. – Fig. 1a-e: *Lagynion macrotrachelum* Pascher. a: cluster on filamentous alga; b, c: side-view; d: side-view of a theca containing two daughter-cells; e: top-view. Fig. 2: *Trochiscia aciculifera* (Lagerh.) Hansg. Fig. 3a-c: *Saturnella saturnus* (Steinecke) Fott. Fig. 4 a-c: *Desmatractum bipyramidatum* (Chod.) Pascher. Fig. 5: *Dicranochaete reniformis* Hier. Fig. 6a-c: *Dicranochaete reniformis* fo. *pleiotricha* Hier. a, b: side-view; c: top-view.



Pl. II. — Fig. 7a-e: *Dinastridium sexangulare* Pascher. a: habitus; b-e: four specimens, showing variation in cell-shape. Fig 8a-c: *Rhabdomonas costata* (Korsh.) Pringsh. Fig. 9a c: *Synura petersenii* Korsh. a: colony; b: scales; c: cyst. Fig. 10a-e: *Mallomonas lychenensis* Conrad. a-c: three cells; d: collar-scale; e: body-scale. Fig. 11a-d: *Poteriochromonas nutans* Jane. a, b: two specimens with typically shaped thecae; c, d: two specimens with aberrantly shaped thecae.



Pl. III. — Fig. 12a-e: *Pachysoeca obliqua* Fott. Fig. 13a-c: *Salpingoeca lefevrei* Bourrel. & Fusey. Fig. 14a-c: *Bicoeca stellata* Bourrel. a: colony; b, c: two separate thecae, showing variation in shape. Fig. 15a, b: *Dendromonas cryptostylis* Skuja. a: colony; b: separate flagellate. Fig. 16: *Phacus skujae* (Lemm.) Skv. Fig. 17a, b: *Colacium mucronatum* Bourrel. Fig. 18a-e: *Askenasyella chlamydopus* Schmidle. a, b: two more developed colonies; c: young colony; d: separate cell; e: macrozoospore.